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GEOMETRY.

293 (Incorrectly numbered 290). Proposed by FRANCIS RUST, C. E., Allegheny, Pa.

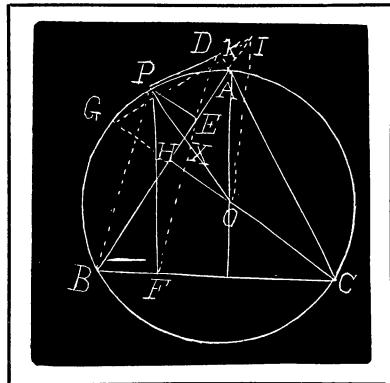
The pedal line of any point on a triangle's circum-circle bisects the distance between this point and the ortho-center of the triangle.

I. Solution by G. W. GREENWOOD, M. A., Dunbar, Pa.

Take, for convenience, an acute triangle ABC and the point P on the arc BC , the feet of the perpendiculars upon BC and CA being D and E , respectively. P is not supposed coincident with B or C . Call the orthocenter O , and let BO cut the circle again in G ; let PQ intersect DE in H and AC in F . Basing the demonstration mainly upon pictorial evidence, we have, since the quadrilateral $PDEC$ is cyclic, $\angle PED = \angle PCD = \angle PGB = \angle GPE$. Hence the triangle PHE is isosceles, and therefore HEF is isosceles, and also $PH = HF$. It can easily be shown that OG is bisected by AC . Hence $\angle OFA = \angle GFA = \angle HFE = \angle HEF$. Hence DE bisects PF and is parallel to OF . It therefore bisects PO .

II. Solution by J. SCHEFFER, A. M., Hagerstown, Md.

Let P be a point in the circumference of the circle, and PD, PE, PF be the perpendiculars let fall from P upon the three sides of $\triangle ABC$, the straight line DEF is the pedal for the point P . Let O be the orthocenter, and draw OH perpendicular AB and extend it to G ; join G with P and produce it until it meets the pedal DEF at K and the side AB produced at I ; draw PB and IO . We now have $\angle PED = \angle PAD = \angle PBC = \angle PGH = \angle IPE$, PE being parallel to GH ; hence $\angle KEI = \angle KIE$, being the complements of the equal angles IPE and PED ; therefore $PK = KE = IK$. But $\angle HIO = \angle GIH = \angle DEI$. Therefore DX is parallel to IO , X being the point of intersection of PO and the pedal DEF . Since K is the middle point of PI , X must be the middle point of PO . Q. E. D.



294 (Incorrectly numbered 292). Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

Apply the locus of $(x^2 + y^2)^3 = mx^3$ to the problem of finding a cube m times a given cube.

[No solution has been received.]

295. Proposed by W. J. GREENSTREET, M. A., Editor Mathematical Gazette, Stroud, England.

A variable circle touches an ellipse, and the chord of contact through the other two points of intersection touches a similar coaxial ellipse. Find the locus of the center of the variable circle.